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A study on 7th grade students' inquiry and communication competencies

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Abstract

The purpose of the present study is to determine the elementary school 7th grades students' inquiry and communication competence. In the present study was employed qualitative research method. The sampling of the study consists of 155, 7th grade students. 7th grades students' competency in inquiry and communication were determined through 29-item "The Competence in Scientific Inquiry " developed by Huey-Por Chang, Chın-Chang Chen, Gwo-Jen Guo, Yeong-Jın Cheng, Chen-Yung Lın and Tsung-Hau Jen (2010). The study employed the survey method were analyzed through SPSS 15.0 program package. By means of appropriate statistics, the data were analyzed.The results of the study, students mostly marked "frequently" option in terms of questioning and communication, so they find themselves highly competent.

Keywords: Inquiry, communication, competency, 7th grade students'.

1. Introduction

Inquiry learning is an educational approach that has a long history (Dewey 1938; Bruner 1961). Inquiry-based learning is believed to be one of the effective approaches to developing a sophisticated and informed view of science (NRC 2000) Through engaging in inquiry practices, students would be aware of the process of producing, testing, and revising scientific knowledge and the criteria of evaluating scientific knowledge claims (Smith et al. 2000).

Scientific experiments are, by nature, inquiry-based activities; students must learn to propose hypotheses, design experiments, and select appropriate materials (Correiro, Griffin & Hart, 2008). Inquiry science teaching engages students in thinking skills and processes, i.e. formulating questions and hypotheses, predicting, interpreting data, synthesizing information, and making conclusions (Chin & Kayalvizhi, 2002).

Research on inquiry learning has repeatedly shown that the inquiry process can be demanding and challenging for students and may thus hinder further learning (Van Joolingen et al., 2005). Therefore, this study aimed to determine in terms of inquiry and communication of students what you they see enough themselves.

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2. Purpose

The purpose of the present study is to determine the elementary school 7th grades students' inquiry and communication competence.

3- Methodology

3.1.Research model

In the present study was employed qualitative research method.

3.2 Sampling

The sampling of the study consists of 155, 7th grade students. In the study, survey method is used.

3.3. Development and administration of the scale

In the study, survey method is used. 7th grades students' competency in inquiry and communication were determined through 29-item "The Competence in Scientific Inquiry " developed by Huey-Por Chang, Chin-Chang Chen, Gwo-Jen Guo, Yeong-Jin Cheng, Chen-Yung Lin and Tsung-Hau Jen (2011). The Competence in Scientific Inquiry scale contained 4 subscales: presenting questions and hypothesis, planning, experimenting and data gathering, and data analyzing, interpreting, and concluding. The Competence in Communication scale contained 4 subscales: expressing, evaluating, responding, and negotiating.

3.4. Data analysis

The study employed the survey method were analyzed through SPSS 15.0 program package. For the reliability analysis of the scale, Cronbach's alpha calculated as 0.98.

4-Finding

Table 4.1. Findings on the basis of the scale item:

	$\overline{X}$
a01.I can ask questions for the parts that cannot be understood by observations in a science class	**3,85**
a02. While learning science, I can collect data about the questions to obtain deeper insights.	**3,87**
a03. While learning science, I can make inferences about the possible answers of the questions.	4,03
a04.In a science class, I can describe the data to be collected during an experiment.	4,00
a05. In a science class, I can select working method suitable for a given question.	4,01
a06. In a science, I consider the possible factors that can affect the experiment.	***4,07***
a07.In a science class, I can design the stages of an experiment according to a given question.	***4,07***
a08. In a science class, I can carefully observe and record the outcomes of an experiment.	4,05
a09. In a science class, I can use tools and equipments necessary to carry out an experiment.	***4,07***
a10. In a science class, I can conduct an experiment in line with the methods of the experiment.	3,99
a11. In a science class, I can classify or compare the data collected in an experiment.	4,03
a12. In a science class, I can use the scientific terms that have been learned to explain the meaning of experimental data.	4,05
a13. In a science class, I can arrange the outcomes based on the mathematical relations between experimental data.	4,04

a14. In a science class, I can explain the experiential outcomes or events based on the results of the experiment.	4,02
b01. In a science class, I can use graphs or mathematical symbols to describe the content of the data.	***4,03***
b02. In a science class, I can convert the data into an easily comprehensible form and present it.	3,96
b03. In a science class, I can explain the relationships among the data in a spoken or written format.	***4,09***
b04. In a science class, I can describe the relationships among the data by means of graphs and mathematical signs.	4,02
b05.In a science class, I can consider the problem from another point of view.	4,00
b06. In a science class, I can evaluate whether what I have explained complies with what I want to explain.	3,97
b07. In a science class, I can evaluate whether others' statements (written or spoken) are correct or not based on the learned information	3,99
b08.In a science class, I can differentiate real states from the results obtained.	3,98
b09. In a science class, I can ask questions about my peers' ambiguous statements.	**3,89**
b10. In a science class, I can ask questions to my peers not giving clear explanations to have them explain again.	3,98
b11. In a science class, when my peers do not understand the topic I have explained, I can explain it from another point of view.	3,92
b12. In a science class, I can detect the similarities and differences among various opinions through discussions.	**3,88**
b13. In a science class, I can question whether my own opinions and my peers' opinions conflict based on the suggestions of my peers.	3,93
b14. In a science class, I can correct my incorrect assumptions based on the correct opinions of my peers.	***4,05***
b15. In a science class, I can share my opinions with the peers through discussions.	4,04
	3,99

The students mostly marked "frequently" option in terms of inquiry and communication, so they find themselves highly competent ($\overline{X}$= 3,99).

The item having the highest mean is item 17, "In a science class, I can explain the relationships among the data in a spoken or written format." *(* $\overline{X}$=4, 09), *and* the item having the lowest mean is item 1, "I can ask questions for the parts that cannot be understood by observations in a science class." ($\overline{X}$ =3,85).

Table 4.2. The scale of sub-dimension in terms of means:

	N	*min*	*max*	$\overline{X}$	*SD*	*t*	*p*
Inquiry	155	14	70	56,21	10,79	1,338	,182
Communication	155	14	70	59,83	11,71	1,339	

When the sub-dimensions of the scale are investigated, the mean for the students' inquiry competency was found to be 56, 21 and communication competency was found to be 59, 83.

Table 4.2.1.Inquiry of sub-dimension in terms of means:

	$\overline{X}$
Developing questions and hypotheses	11,77

Planning	16,16
Conducting experiments and collecting data	12,12
Data analysis, interpretation and evaluation	16,16

The means for the sub-dimensions of questioning competency are as follows; developing questions and hypotheses 11,77, planning 16,16, conducting experiments and collecting data 12,12, data analysis, interpretation and evaluation 16,16.

Table 4.2.2. Communication of sub-dimension in terms of means:

	$\overline{X}$
Explanation	16,11
Evaluation	15,96
Responding	11,80
Interviewing	15,92

The means for the sub-dimensions of communication competency are as follows; explanation 16, 11, evaluation 15, 96, responding 11, 80, interviewing 15, 92.

Table 4.3.Competence of inquiry and communication Scores by Gender for Students T-Test Result

	n	$\overline{X}$	*SD*	*t*	*p*
Female	69	119,05	31,80	,949	,344
Male	86	113,59	38,38	,969	

As can be seen in Table 3.1, no significant difference based on gender was found between the students' inquiry and communication competencies (p< ,01). This indicates that gender is not an important factor affecting inquiry and communication competencies. The arithmetic mean score for the attitudes of female students is inquiry and communication competencies $\overline{X}$=119,05 and $\overline{X}$=113,59 for male students.

Table 4.4. The relationship between inquiry and communication

		n	Correlation	*p*
Inquiry	Inquiry	155	1	,000
	Communication		,921	
Communication	Inquiry	155	,921	,000
	Communication		1	

There is significant difference found between inquiry and communication competencies (p< ,01). And the difference found favors communication competency. It is seen that there is a high level of positive significant correlation between communication competency and inquiry competency. Hence, it can be argued that with improving inquiry competency, communication competency also improves.

5. Results:

It can be argued that in general, the students' inquiry and communication competencies are at the same level. On the other hand, it is seen that parallel to improving communicative competency, the competency of inquiry also

improves. It can be said that, the more effective teacher-student and student-student communication is, the more effective inquiry process is.

It was found that both male and female participants of the study find themselves competent in terms of communication and inquiry competencies at the same level. In general, the students state that they have enough competencies to make explanations but their competency to ask questions is not adequate.

In the research, the three items having the highest mean on the basis of inquiry, "6. In a science, I consider the possible factors that can affect the experiment." "7.In a science class, I can design the stages of an experiment according to a given question." "9.In a science class, I can use tools and equipments necessary to carry out an experiment." were found. In the lowest two items, "1.I can ask questions for the parts that cannot be understood by observations in a science class", "2. While learning science, I can collect data about the questions to obtain deeper insights." were found. The two items having the highest mean on the basis of planning, "6.In a science, I consider the possible factors that can affect the experiment." "7.In a science class, I can design the stages of an experiment according to a given question." were found. The two items having the highest mean on the basis of data analysis, interpretation and evaluation "12.In a science class, I can use the scientific terms that have been learned to explain the meaning of experimental data." and "13. In a science class, I can arrange the outcomes based on the mathematical relations between experimental data." were found.

In the research the two items having the highest mean on the basis of communication "b03. In a science class, I can explain the relationships among the data in a spoken or written format." and "b14. In a science class, I can correct my incorrect assumptions based on the correct opinions of my peers" were found. In the lowest two items, "b12. In a science class, I can detect the similarities and differences among various opinions through discussions." and "b09. In a science class, I can ask questions about my peers' ambiguous statements." were found. The two items having the highest mean on the basis of explanation "b03.In a science class, I can explain the relationships among the data in a spoken or written format." and "b01. In a science class, I can use graphs or mathematical symbols to describe the content of the data." were found.

When the sub-steps investigated are examined, it is seen that the students think that they are relatively less competent in terms of asking questions and creating hypotheses and more competent in terms of planning, analysis and interpretation of the data and reaching conclusions.

When the sub-steps of communication are examined, it is seen that in general the students find themselves more competent in terms of making explanations, evaluations and interviews, and less competent in terms of finding answers.

A number of studies of inquiry science teaching and learning (Cohen & Spillane 1993; Lee, Hart, Cuevas, & Enders, 2004; Lott, 1983; National Research Council (NRC), 1996; Shymansky, Kyle, & Alport, 1983; Tamir, 1983; Von Secker & Lissitz, 1999; Wu & Hseih, 2006) have shown that inquiry science has positively affected a variety of student outcomes such as achievement and attitudes; process skills; problem solving and creativity; vocabulary knowledge; conceptual understanding and critical thinking; inquiry abilities; and ''scientific ways of thinking, talking, and writing'' (NRC, 1996).Research on effectiveness of IBL on students' learning, indicated improvement in students' understandings and in their process skills (Wallace, Tsoi, Calkin, & Darley, 2003;Fortus, et al. 2004; Marx, et al. 2004; Tatar, 2006; Wu & Krajcik, 2006; Sullivan, 2008).

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